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EXAMINER	
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ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.  
08/636,069

Applicant(s)  
Sandhu

Examiner  
Matthew Whipple

Group Art Unit  
2813



☒ Responsive to communication(s) filed on Sep 13, 1999

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

## Disposition of Claims

☒ Claim(s) 1, 2, 4-10, and 31-54 is/are pending in the application.

Of the above, claim(s) none is/are withdrawn from consideration.

☐ Claim(s) \_\_\_\_\_ is/are allowed.

☒ Claim(s) 1, 2, 4-10, and 31-54 is/are rejected.

☐ Claim(s) \_\_\_\_\_ is/are objected to.

☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some\* ☐ None of the CERTIFIED copies of the priority documents have been  
☐ received.

☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

Art Unit: 2813

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4-10, 31, 33-34, 36, 39-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-050966 (Hisamune). Hisamune clearly teaches applicant's invention, but does not expressly teach not directly exposing the substrate surface with the light source.

However, it would have been obvious to one of ordinary skill in the art that the lamps may be placed so as not to illuminate the surface directly, because Hisamune teaches to induce a photochemical reaction of the gaseous starting materials with ozone, which requires only that the gases be illuminated. This teaching suggests that the substrate need not be illuminated. Indeed, Hisamune never teaches that the substrates need be illuminated, but instead broadly teaches illuminating the inside of the "reaction chamber". Further, applicant does not provide any reason or benefit for not illuminating the wafer, but merely states that "It is not necessary . . . to illuminate the substrate surface" (p 7, lns. 23-25). In fact applicant's specification teaches to "uniformly illuminate the reaction surface of the substrate" (pg. 6, ln. 6). Therefore, applicant's invention is not seen as providing a patentable distinction over the prior art.

Art Unit: 2813

Hisamune teaches that films may be deposited at temperatures lower than 400° C while still achieving sufficient growth rates. Applicant claims “about” 480° C. Therefore, the Hisamune reference anticipates applicant’s deposition temperature because “about” 480° C is only a 20% increase from 400° C.

Alternatively, if it is somehow seen that applicant’s deposition temperature is not anticipated, then this would be a difference.

It has been held that optimization of parameters is obvious (see *In re Aller* 105 USPQ 233 (CCPA 1955)).

Therefore, it would have been obvious to choose the temperature of applicant’s claimed process because Hisamune teaches temperatures near applicant’s and because Hisamune teaches that temperature is related to deposition rate and film density, so that even though lower temperatures may be usable, it would be obvious to increase temperature to provide an even faster deposition rate and more efficient process which provides a quality silicon oxide film, according to the precedent set by *In re Aller*. Further, applicant has failed to show any criticality to the temperatures.

The only difference between applicant’s claim 36 and the Hisamune process is that the exact ozone concentrations are not taught.

However, it has been held that optimization of result effective variables is obvious. See *In re Aller* 105 USPQ 233, 255 (C.C.P.A. 1955).

Art Unit: 2813

Therefore, it would have been obvious to optimize the required ozone concentrations to provide effective oxidation of TEOS to form the film taught by the Hisamune reference, according to the precedent set by *In re Aller*.

3. Claim 32, 51, 52, is rejected under 35 U.S.C. 103(a) as being unpatentable over Hisamune as applied to claim 31 above, and further in view of U.S. Patent 4,287,083 (McDowell et al.).

Hisamune teaches that a mercury lamp should be used, but does not specifically teach a mercury arc vapor lamp.

However, McDowell et al. teach that in the coating industry, mercury arc vapor lamps are well known for providing UV radiation.

Therefore, it would have been obvious to one of ordinary skill in the art at time of the invention to apply the teachings of McDowell et al. because a mercury lamp is required and McDowell teaches that mercury arc vapor lamps work effectively for providing the requisite UV radiation.

4. Claims 35, 37, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisamune as applied to claim 31 above, and further in view of U.S. Patent 5,000,113 (Wang et al.).

Hisamune is silent about pressures and the use of Helium as a carrier gas.

However, Wang et al. teach a similar TEOS/ozone process where helium is used as a carrier gas and a pressure range of about 10-200 torr is taught (col. 20, lines 40-49).

Art Unit: 2813

Further, it has been held that optimization of result effective variables is obvious. See *In re Aller* 105 USPQ 233, 255 (C.C.P.A. 1955). It has also been held that choosing values within known ranges is *prima facie* obvious. See *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

Therefore, it would have been obvious to optimize the pressure to provide effective oxidation of TEOS to form the film taught by the Hisamune reference, according to the precedent set by *In re Aller*. It further would have been obvious to choose applicant's claimed pressures in the Hisamune process because Wang et al. teaches a similar process with overlapping pressures, according to the precedent set by *In re Wertheim*.

Also, it would have been obvious to use helium as a carrier gas because Hisamune suggests that other carrier gases may be used and because Wang et al. teaches it is well known in the art for use in similar processes.

5. Claims 1, 2, 4-10, 41, 43-50 are rejected under 35 U.S.C. 103(a) as obvious over JP 2-050966 (Hisamune) in view of U.S. Patent 5,633,211 (Imai et al.).

Hisamune clearly teaches applicant's process of illuminating ozone and a silicon source gas with a mercury arc lamp to deposit silicon dioxide onto a wafer surface. Hisamune further teaches that the reason for irradiating the inside of the reaction furnace with UV radiation is to induce a photochemical reaction of the gaseous starting materials with ozone (translation, p. 5, lns. 20-21). Hisamune teaches a phosphorus dopant may be added, but does not teach a second dopant.

Art Unit: 2813

However, Imai teaches that it is conventional to use both boron and phosphorus to form BPSG films which reflow at low temperatures (col. 1, lines 35-42 and col. 2, lines 6-10).

Applicant's claimed boron source gases are taught (col. 1, lines 50-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to also use a boron source gas to allow reflow at lower temperatures to provide for a more planar surface, as taught by Imai.

The only difference between applicant's claim 46 and the Hisamune process is that no fluorinated precursor is taught.

However, Imai teaches that TEOS may be substituted with a fluorinated precursor to provide better flow of the deposited layer (Abstract and col. 5, lines 41-42).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the fluorinated precursor teachings of Imai to the Hisamune process for the reasons given by Imai.

6. Claims 53 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisamune in view of Imai as applied to claim 52 above, and further in view of McDowell et al..

Hisamune and Imai do not teach a mercury arc vapor lamp.

McDowell et al is applied as above.

Art Unit: 2813

***Response to Arguments***

7. Applicant's arguments filed 9/13/99 have been fully considered but they are not persuasive.

Applicant has argued that 400° c is not about 480° C. However, applicant's use of "about" is subject to broad interpretation of a range of temperatures around 480° C. However, even if Hisamune was not considered to anticipate, applicant's range is obvious because one of ordinary skill in the art would know that raising temperature would raise deposition rate and result in a more dense, higher quality film, so that it would be obvious to do so in order to increase production. Further, applicant has failed to show any criticality to the higher temperatures.

Applicant has further argued the Imai reference is not combinable with Hisamune because Imai may not teach photo CVD. However, a reference is not required to disclose every possible embodiment. Further, the Imai reference is a secondary reference used to alter the teachings of Hisamune, not the reverse. Therefore, the question is not whether it would be obvious to use photo CVD in the Imai process, but rather, is it obvious to substitute the dopant source gases of Imai in the Hisamune process. The examiner concludes that it would be obvious to do so because doping oxide films in the semiconductor art is extremely well known and obvious in order to provide reflowable films, gettering, and lower dielectric constant films (in the case of fluorine). Therefore, applicant's argument is moot.

Art Unit: 2813

***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 4,916,091 (Freeman et al.) also teaches a process similar to applicant's claims (see col. 16, ln. 63 to col. 17, ln. 55).

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew Whipple whose telephone number is (703) 308-2521.

mw  
12/2/99

Charles D. Bon J  
Charles D. Bon J  
Examiner  
12/2/99